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*Kind regards to the Author.*

HEAD-INJURIES ACCOMPANIED BY PARALYSIS.

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A CLINICAL LECTURE,

*Delivered at the Bellevue Hospital.*

BY

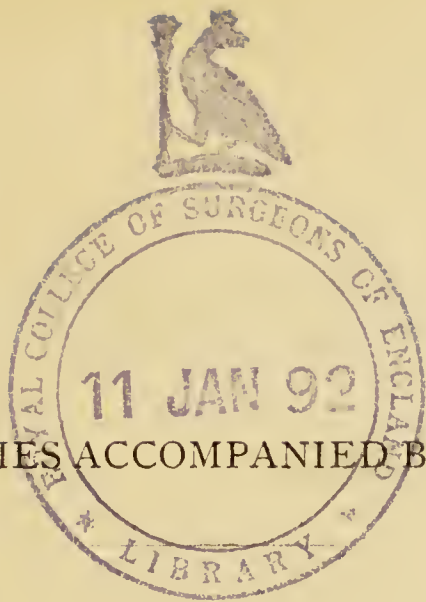
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## HEAD-INJURIES ACCOMPANIED BY PARALYSIS.

GENTLEMEN: The first case which I shall introduce to you this afternoon is that of a child, whom you saw in the clinic last Saturday suffering from complete hemiplegia. If you refer to your notes, you will find that this little boy, three months since, sustained a compound fracture of the skull, by falling from a great height, and that after the depressed bone was elevated the child recovered. During the past few weeks he has not been feeling well, suffering from slight headache, elevation of temperature, and acceleration of pulse. He has lost his accustomed appetite, has become exceedingly irritable, and does not sleep well. The wound upon the head appears unhealthy, and discharges a small quantity of sanious pus. These symptoms have gradually become exaggerated, and have finally resulted in complete hemiplegia, in which condition you saw the child at my last clinic. The history of the case, I then told you, pointed to an intracranial abscess beneath the site of the original wound. That diagnosis was correct, for considerable pus was discharged through the opening made last week. Last Saturday this little fellow was completely paralyzed upon the side opposite to his head-injury. The child has gradually improved daily, and, as you see, can move the leg and the arm, and now the nurse will let him down from her arms, and you observe that he is able to walk out of the clinic, and also to raise his arm sufficiently to seize the hand of the nurse.

This, then, is a typical case of paralysis which was caused by pressure of pus upon the brain, and I will

avail myself of this case to base a few remarks upon the question of "Trephining for the Relief of Paralysis in Head-injuries."

You know that in my didactic lectures I told you that compression of the brain with paralysis was due to some kind of pressure, of which *bone, pus, blood, foreign body*, were the chief causes, and you remember that each cause was considered at length with the diagnostic symptoms. In the clinic to-day I will show you cases illustrating these four causes of paralysis, in order forcibly to impress upon your minds the lessons which were then inculcated. I further remarked, in connection with this subject, that at times it was very difficult to establish a correct diagnosis, even with good data to aid and with symptoms well pronounced. Since lecturing to you upon that subject, I have met with a case illustrating in a striking manner the uncertainty and difficulty of making a diagnosis, and I will refer to the patient in the way of a short digression, as the case seems especially pertinent.

A man was struck upon the side of the head two weeks before admission into the Ninety-ninth Street Reception Hospital, and although he was unconscious a few minutes after the blow, he soon regained consciousness and was apparently well for over a week, when he had symptoms very similar to those described in the case of the little boy, who, a week ago, was paralyzed, but to-day has just walked out of the clinic. When the ambulance brought the man to the hospital, he was in coma, and had complete hemiplegia upon the side of the body opposite to the head-injury, the evidences of which were manifest locally, and the fact of the injury was corroborated by the testimony of his friends. The question of abscess of the brain as a result of the head-injury suggested itself to me, considering the hemiplegia and coma following two weeks after a severe blow with a club upon the head. The operation of trephining was

indicated, but before deciding upon this step I had the temperature taken and the urine examined. There was slight elevation of temperature, but not sufficient to indicate formation of pus. The urine was heavily loaded with albumen and contained casts. I deferred the operation for these two reasons, and the autopsy upon the following day revealed the wisdom of the course of non-interference, for the case proved to be one of ordinary apoplexy, or hemorrhage into the corpus striatum, occurring incidentally with a severe blow upon the head, which injury perhaps may have acted as an exciting cause to develop the apoplexy.

Thus you see, Gentlemen, that while the history of the case would naturally suggest compression from pressure due to pus as the cause of the hemiplegia, and indicate the use of the trephine, the absence of sufficient elevation of temperature, and the presence of a considerable amount of albumen and casts pointed to another probable cause for the hemiplegia. The case of the little boy and that of the man, from a clinical point of view, are of great interest, as illustrating the principle and impressing the lesson of examining carefully and thoroughly into every case, and of using every means at hand in order to establish a correct diagnosis before attempting any surgical operation upon the head.

These two cases further present for your consideration two of the four causes of paralysis, namely, *pus* and *blood*, and although no operation was indicated to relieve the paralysis in the case where the blood was the cause of the hemiplegia, yet you are not to understand that an operation is not indicated where there is a surface clot in head-injury, and this leads us to the fact that blood may cause paralysis in one case and no operation can be performed, while in another case an operation may relieve the hemiplegia, and the cause still be from pressure of blood.

I will present to you, next, a case in which *bone* was



the cause of the paralysis, and which will further afford a most beautiful example of cerebral localization. This patient, whom you all now see, and whom some of you saw when he was trephined, has the following history : He was working in a cellar when a paving-stone fell upon him from a height of twenty feet, striking him on the head. He was seen by the ambulance surgeon, Dr. Keene, of St. Vincent's Hospital, a few minutes after the injury, when he was found to be quite conscious, but for a minute exhibited clonic convulsions of the left arm. These movements were not afterwards repeated, but were succeeded by chilly sensations. His pulse was regular and about seventy to the minute, his respirations were rapid, and his pupils were normal. There was a contused, lacerated wound over the right side of the head, at about the junction of the parietal with the temporal regions. From this wound there was profuse hemorrhage, and at the bottom of the wound the bone was felt to be markedly depressed. When admitted to the hospital the right pupil was wider than the left, and sluggish in its action ; the pulse was slower, about sixty to the minute, and bounding ; the respirations were deep and noisy, the extremities were cold, and the patient perfectly conscious. There was partial paralysis of the left arm ; he could not flex or extend the elbow, but could, with difficulty, partially abduct the limb from the side. He complained of severe pain in the muscles of the neck, especially on the left side. He was placed immediately under ether and the wound in the scalp was enlarged, which exposed a stellate depressed fracture ; the fragments were raised into position, after removing a small portion of bone with the Hey's saw, and sixteen pieces were taken out of the skull from the bottom of the wound. The exposed dura mater was uninjured, and the brain was seen pulsating beneath it. The wound was cleansed and dressed with carbolic lotion, one to forty, and in a short time healed by granulation,

with a firm cicatrix. The paralysis at once subsided after the operation, and his temperature, pulse, and respiration remained about normal during convalescence.

This patient is one of the most interesting cases to illustrate paralysis from pressure of bone. The case is highly instructive for this purpose; but when you study it more closely you see at once a rich field of inquiry open to you. It is a case illustrating recent views concerning cerebral localization, and on account of the rarity of these cases and the accuracy of the diagnosis, you will at once perceive that it is one of the few cases recorded of cerebral localization from pressure by bone. Some valuable contributions of this nature are found in Nothnagel's well-known work, *Topische Diagnostik der Gehirnkrankheiten*, Berlin, 1879; also by Ferrier, and the writings of Charcot and Pitres in various French journals. In the *Revue de Médecine* Charcot and Pitres are now publishing a series of most interesting articles. Experiments on animals are much less conclusive as regards the localization of functions in the human brain than are well-observed pathological cases in man. It is established by the researches of Charcot and others, that the motor part of the cerebral cortex in man embraces the central convolutions, the paracentral lobules, and a part of the adjacent convolutions. According to Charcot and Pitres, there are motor centres for the opposite side of the face in the lower part of the central convolutions, particularly of the anterior central; motor centres of the arm in the middle third of the anterior central convolution; and centres for the opposite upper and lower extremities in the paracentral lobule and upper parts of the central convolutions. The separate centres for the opposite lower extremities appear, according to Charcot, to be in the paracentral lobule; but they have not been so accurately determined as those of the upper extremity, because cortical paralysis confined to the lower extremity is very rare. Cortical paralyses may be in the form of

total hemiplegia, of associated monoplegias (as paralysis of one arm and of one side of the face), or of pure monoplegias (as paralysis of the arm alone).

The most common example of a pure monoplegia due to cortical lesion is brachial monoplegia, or paralysis of one arm. In brachial monoplegia of cortical origin, the lesion is situated in the middle third of the anterior central convolution. Now, Gentlemen, this case before us, on the table to-day, was one of pure brachial monoplegia. The lesion therefore would be of the middle third of the anterior central convolution. There was no paralysis except that of the left arm. This case before us is one of great value, as showing the importance to a surgeon of the knowledge of recent studies in cerebral localization—also for the clear and precise nature of the symptoms and their strict localization. The ataxia which existed for a short time after the paralysis disappeared was interesting, and was probably due to a temporary disturbance in the nutrition of the motor centres. Upon this brain, which is hardened in nitric acid, you see the exact point of pressure which caused the brachial monoplegia in the brain of the patient, who is here in the clinic to-day.

The fourth and last cause of paralysis from head-injury is due to the presence of a *foreign body*, as a bullet, piece of iron, or any other hard substance which has been driven into the brain. I now show you several such bodies which others and myself have removed, and which foreign bodies have been the cause of paralysis.

This completes the four causes of paralysis from head-injury, but before dismissing this most interesting subject I must avail myself of another case, which I now introduce to you, and which was one of paralysis with no injury of the brain, but an injury to the spinal cord.

This man was brought to the Ninty-ninth Street Reception Hospital by the ambulance on account of an injury sustained by a heavy bank of earth caving in



and falling upon his back. He suffered from paralysis of his left leg, and from anæsthesia of his right leg, both of which symptoms occurred shortly, although not immediately, after the accident. His bladder was also paralyzed. I made the diagnosis of spinal hemorrhage, and the history of the case has confirmed the diagnosis. This case illustrates a very interesting and rare form of paralysis, due to an affection involving the spinal cord. This form of paralysis is called spinal hemiplegia, or spinal hemiparaplegia, according as the arm and leg are both affected, or the leg alone is involved. We owe to Brown-Séquard most of our knowledge upon this subject. His conclusions are based upon experiments upon animals, and afford an admirable example of the importance of such experiments. Brown-Séquard has proved that if one lateral half of the spinal cord be cut across in the dorsal or in the lumbar region, there results paralysis of motion in the lower extremity on the same side as the lesion, with loss of sensation, or anæsthesia of the opposite lower extremity. This condition is called hemiparaplegia. If the lesion affected the lateral half of the cord in the cervical region, then the arm and the leg on the side of the lesion are paralyzed, and the condition is called spinal hemiplegia. In the extremity with paralyzed motion, sensation is intact, or may be even exaggerated (hyperæsthesia).

In the patient before us we found incomplete paralysis or paresis of the left leg, which, however, retained its sensibility, and, in fact, for a few days seemed to be hyperæsthetic. In the opposite leg motion was perfectly normal, but there was marked loss of sensation, although not complete anæsthesia. The loss of sensation was made evident by pricking the skin, and by the use of the æsthesiometer. The case therefore belongs to the class of spinal hemiparaplegias described by Brown-Séquard. These symptoms developed soon after his injury, which was caused, as I have already mentioned,

by a bank of earth falling upon his back. We cannot be positive as to the nature of the lesion, but it seems probable that a small hemorrhage occurred in the spinal meninges, and caused pressure upon one lateral half of the cord. This was the diagnosis I made at the time of the accident, and the rapidity of his recovery, as well as the manner of his recovery, would indicate this as the probable lesion, the symptoms disappearing as the blood was removed by absorption. Such cases are extremely rare. They illustrate the important physiological fact that the motor fibres do not cross to any considerable extent in the spinal cord, while the sensory fibres cross throughout the whole course of the cord.

This unique combination of cases, all occurring about the same time, has enabled me to bring before you in a striking and forcible manner the question of trephining in head-injuries associated with paralysis, and also the question of paralysis in injuries of the spinal cord. Spinal hemiparaplegia, from its infrequency, and the group of cases illustrating all the causes of paralysis in head-injuries, form a most important theme for study and reflection, and if they only prove to illustrate the great principles which have been insisted upon in the didactic lectures, of which the clinic to-day is an attempt to impress by illustration, I shall be content with the hour's work; and in concluding this part of the subject let me add that much is yet to be learned in this important domain of surgery, and I trust that the exhibition of these cases will increase your zeal in the study of paralysis arising from surgical causes.

Before dismissing this important surgical topic, there is still one other principle I would like to illustrate. You remember that in my didactic lectures I told you that in compound fractures of the skull, where the trephine is indicated, the prognosis depends not so much upon the extent of the fracture of the bone, as upon the question of the amount of injury done to the contents of the skull.

The same surgical axiom holds good in cases of fracture of the pelvis ; it is not the fracture of the bone so much as the injury to the pelvic organs which influences the prognosis. To recur to our first proposition, and to strengthen it by several living illustrations, I introduce first to you the patient whom some of you saw operated upon at the Ninety-ninth Street Hospital. This patient, who has kindly consented to come to my clinic to-day, is a man who sustained a compound comminuted fracture of the frontal bone, produced by the kick of a vicious horse. It is sufficient to say that sixty-four pieces of bone were removed from a wound which embraced nearly the entire forehead. Many of these pieces were large, and the extent of the comminution made it necessary for the house-surgeon, Dr. Fergusson, to take away most of the frontal bone. The contents of the brain appeared uninjured, and the man to-day is perfectly well, and is engaged at his usual avocation. The second case is one whom you now see, and from whom thirty pieces of bone have been removed, owing to a compound comminuted fracture of the skull produced by direct violence. In this man's case the contents of the skull were not injured, and this fact made the prognosis good, whereas, otherwise, it would have been most serious.

The third case, which I now show you, is one in which I trephined for persistent headache of six years' duration, and after removing a circular plate of bone over the seat of an old depressed fracture, the symptoms entirely disappeared, and the patient has been entirely free from the severe pain, the cause of which was revealed by the operation to be pachymeningitis externa. There was no injury to the brain itself, and the operation consequently was attended with no danger. These cases, together with others which I have operated upon from time to time, only strengthen the truth of the statement, that, with the dura mater uninjured, and the brain itself undisturbed, the prognosis is always good. In conclu-



sion, it is surprising to learn how many eminent surgeons have been, and are even now, opposed to the use of the trephine. Notwithstanding the favorable results from trephining which you have seen from time to time in this clinic, yet there are surgeons who still decry the operation. In Mr. Gamgee's recent work on the treatment of fractures, one of the most valuable contributions made to the surgery of this subject, and a book which I am sure you will study with great profit and pleasure, you will find a most interesting chapter upon this very question of trephining. He shows that there is still a very wide diversity of opinion among eminent surgeons upon this point, and that while during the last century the trephine was used extensively, Desault, a French surgeon, was the first to oppose its use. Percival Pott, an English surgeon, on the other hand, urged its indiscriminate use. John Hunter, Pott's most illustrious pupil, advocated its use, and there were then two distinct classes—on the one side Desault, John Bell, Astley Cooper, Abernethy, Liston, and others argued against its use; on the other side Pott, Hunter, Guthrie, Brodie, Velpeau, and others argued in its favor. This great controversy influenced in different countries the number of the operations. Thus, during ten years from 1855, there were reported only four cases of trephining in France, while in England during the same period there were reported, according to Le Fort's analysis, one hundred and fifty-seven cases. The late Mr. Callender stated that the trephine had not been used for six years in St. Bartholomew's Hospital, though Mr. Callender was the successor of Percival Pott, through such a lineage as Abernethy, Lawrence, and Paget. This change in the very hospital which was formerly the arena where the trephine was so frequently resorted to, is as strange as it is significant.

When we consider how frequently trephining was performed in very early times, and with success, assuredly



in these days surgeons should not hesitate to perform an operation which holds out such good prospect of recovery. During the Stone Age, Prof. Broca has informed us that trephining was practised by the ancients with only pieces of flint, and with these rude instruments they scraped the bone until a disk was removed sufficient to expose the dura mater. Mr. Blaker, of London, in a very valuable historical contribution says, "considering the class of cases, the desperate nature of the operation, and the barbarous method of performing it, to say nothing of the after-consequences, *e. g.*, hemorrhage, blood-poisoning, erysipelas, the danger of injury to the brain, the want of proper nursing, and bad hygienic surroundings generally, it is wonderful that any one patient recovered; and yet, incredible though it seems to be, Dr. Prunères states that out of twenty skulls in his possession (all of which were trephined during life) nineteen of them exhibit indubitable signs of having recovered from the operation." He further states that these disks of bone were worn as amulets and considered as talismans to ward off disease. Where the patient died, the amulet was attached to the body as a sort of talisman to ward off evil spirits in another world. Prof. Broca adds that this is one of the earliest indications we have recorded in history "of the belief in a life beyond the grave."

Thus you observe, Gentlemen, that the operation which you have witnessed in the clinic is of very great antiquity, and with the resources of modern surgery the operation should be free from danger.

With the great diversity of opinion upon the question of trephining, I am not surprised that many of you are in doubt as to which course to pursue. My advice to you in this matter, as in many other difficult questions in surgery, is to be guided not by history, nor by tradition, nor by single authority, for often these guides mislead and misdirect. History, and tradition, and authority

may not be trustworthy guides for you in these great emergencies. Let your actions be governed by the individual circumstances which arise in connection with each particular case. Consider every case by itself, and where the indications which I have already given you are present, trephine ; but where they are absent adopt the plan of non-interference. The subject of the manner in which the operation is to be performed will be considered in our demonstrative course upon the cadaver ; and now, Gentlemen, I will say no more to-day upon the question of trephining, but leave this subject for you to reflect upon and carefully to study over, in the hope that the few hints which I have given you may awaken a new interest in a surgical theme as trite as it is important, and as difficult as it is fascinating.



